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GAS ABSTRACTS

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1. GAS INDUSTRY

Liquid Fuels

Gunness, R. C. FUTURE LIQUID FUELS. *Chem. Eng. News* 29, 2123-2127, 2171 (1948) *July* 19.

Demand for petroleum products has increased fourfold during the past 25 years. In 1947 daily demand was 5,850,000 bbls, of which less than 10% was imported. By 1970 the demand will exceed 7,000,000 bbls per day mainly as a result of increased car, truck and locomotive use. This requirement can be met by domestic oil production, foreign imports and synthesis of oil from natural gas and coal. It appears unlikely that economics will permit oil from coal to compete for markets in which coal can be used directly so that a gradually diminishing supply of residual fuel oil for industrial purposes appears in prospect.

C. H. Riesz

LP-Gas Markets

Eberhart, F. F. WORLD LP-GAS MARKETS WAIT ON FREE EXCHANGE. *LP-Gas* 8, 55-57, 127-136 (1948) *June.*

The position of the liquefied petroleum gas industry in the world's various geographical areas is analyzed. Importation of LP-gas and appliances for its use is limited in many areas by the scarcity of dollars. Exports of all LP-gases from the United States in 1947 totaled only 53 million gallons, less than one per cent of the marketed domestic production. Statistics are meager, but it seems unlikely that foreign sources produced more than another 53 million gallons. Of our total exports, Canada took some 59% and Mexico about 31%. A breakdown of our LP-gas exports by receiving countries is given in the article, as are other statistics pertinent to estimating future demand by geographical areas.

J. C. Lane

Research

Pennington, J. V. RESEARCH ACTIVITY REACHES NEW HIGH ON GULF COAST. *Oil Gas J.* 47, 253-255 (1948) *June* 24.

A number of research projects are being prosecuted by private companies and by such organizations as the A.P.I. Nothing specific is stated as to where the individual projects are undergoing study and the projects themselves are mentioned only in a general manner. They include use of radioactive isotopes for chemical research and well logging, off-shore drilling and corrosion, gas transmission and production of petrochemicals.

J. D. Parent

2. APPLIANCES

Gas-Oil Burner

Young, C. C. GAS-OIL BURNER OFFERS PEAK STAND-BY PROTECTION FOR HOMES. *Gas Age* 102, 27-29, 68, 70, 72 (1948) *August* 5.

Advantages to the gas utilities of a newly developed combination oil and gas conversion burner are pointed out.

E. F. Davis

COMBINATION OIL—GAS BURNERS DETRIMENTAL TO OIL HEATING. *Fuel Oil & Oil Heat* 7, 72-73 (1948) *August.*

The potential effect of the oil-gas burners on the oilheat interests is discussed.

E. F. Davis

Heat Pump

Kemler, E. N. DESIGN OF EARTH HEAT SOURCE SYSTEMS. *Heating & Ventilating* 45, 70-73 (1948) *August.*

Information available on the design of earth heat systems is meagre, and experimental data are limited. This article considers some of the factors involved in the design of such systems and discusses possible ways of simplifying their design.

Author's abstract

Incinerator

Bissey, L. T. NEW DESIGN HOUSEHOLD INCINERATOR ELIMINATES SMOKE AND ODOR. *Gas Age* 102, 30-31, 72 (1948) *August* 5.

A domestic gas-fired incinerator has been developed for the disposal of household wastes without annoying smoke and odor. The method of incineration involves the use of radiant surfaces to elevate the temperature of the effluents from the burning refuse to rid them of smoke and odor.

E. F. Davis

LP-Gas Burner

Clifford, E. A. HOW TO DETERMINE LP-GAS BURNER CAPACITIES. *LP-Gas* 8, 29-31, 90-91 (1948) *August.*

A simplified method is given for determining burner port sizes, number of ports, throat area and other burner design features.

E. F. Davis

Lumber Drying

Burns, A. F. and Hyde, W. S. GAS-FIRED LUMBER DRYING KILNS. *Industrial Gas* 27, 13, 25-26 (1948) *August.*

A description of a natural draft and a forced draft lumber drying kiln is given.

E. F. Davis

Pilot Burner Design

RESEARCH IN DESIGN METHODS OF PREVENTING CLOSURE OF GAS PILOT BURNER PRIMARY AIR OPENINGS BY DUST AND LINT. *Am. Gas Assoc. Testing Laboratories Research Bull.* 46, (1947) *December.*

Variations in size and position of primary air openings, burner tube diameter, shields and other protective devices are discussed relative to the design of a satisfactory blue flame pilot burner for resisting stoppage due to dust and lint suspended in the atmosphere.

E. F. Davis

Space Heater

DIRECT FIRED SPACE HEATER SERVES COMFORT, PROCESSING REQUIREMENTS. *Heating, Piping, Air Conditioning* 20, 95-96 (1948) *August.*

A single direct fired space heater is described which performs six different operations in a rug manufacturing plant.

E. F. Davis

3. COMBUSTION AND INDUSTRIAL FURNACES

Boilers

Johnson, W. and Grater, N. THE GAS-FIRED STEAM BOILER IN INDUSTRY. *Gas World "Supplement,"* (British) **129**, 73-80 (1948) *July* 17.

A discussion of the uses, operation and maintenance of gas steam boilers in industry.

E. F. Davis

Partington, H. CENTRAL HEATING. *Gas* (British) **2**, 858-868 (1948) *August.*

This paper relates several experiences in converting large solid fuel boilers to gas.

E. F. Davis

Combustion with Oxygen

Fehling, H. R. COMBUSTION WITH OXYGEN AND OXYGEN-ENRICHED AIR. *J. Inst. Fuel* (British) **21**, 221-235, 241 (1948) *June.*

In view of the anticipated large-scale industrial development of oxygen-enriched combustion processes, the technical and thermodynamic implications are reviewed. Combustion with oxygen differs from combustion with air not only in degree but also in kind. At the higher temperatures involved in combustion with oxygen, the gases are appreciably dissociated and the nature of the flame differs considerably from that obtained with air. The effects of dissociation and recombination on radiation and convection processes are expected to open up new possibilities in heat transfer. At 1500°C an integrated process, in which waste heat is employed for oxygen production, will leave 70% of the fuel energy available for heating the charge and making up those heat losses which originate at the furnace proper.

A. J. Rudnitzki

Electric Spark Ignition

Mache, H. INCREASED IGNITION POWER OF ELECTRIC SPARKS BY LOCALLY CHANGING THE COMPOSITION OF THE GAS MIXTURE. *Engrs' Digest* **5**, 265 (1948) *July;* (From *Oesterreichisches Ingenieur Archiv, Vol.* 1, *Nos.* 4/5, *pp.* 273-277 (1947).

A method is described for changing the gas to air ratio at the electrodes to aid in obtaining ignition of the mixture with spark gap electrodes.

E. F. Davis

Furnace Heat Transfer

Mullikin, H. F. DETERMINING FURNACE HEAT TRANSFER BY GAS TEMPERATURE MEASUREMENT. *Power Generation* **52**, 68-71, 116, 118, 120, 122 (1948) *August.*

Comparisons are made of various methods of measuring furnace gas temperatures. It is shown that with accurate measurements the heat transfer data will be more reliable.

E. F. Davis

Heating Metals

Clauser, H. R. HEATING METALS BY INDUCTION AND HIGH-SPEED GAS METHODS. *Materials and Methods* **28**, 55-59 (1948) *July.*

Comparisons are made between induction heating and high speed gas heating for surface hardening, forging, heat treating and brazing of metals.

E. F. Davis

LP-Gas Engine

Stratman, E. A. BUTANE-PROPANE CARBURETION. *Butane-Propane News* **10**, 128-130, 132 (1948) *August.*

A complete description of a LP-gas engine carburetion system is given. Diagrams and illustrations are used to aid in this description.

E. F. Davis

4. CARBONIZATION AND GASIFICATION

Carbonizing Properties of Coals

Brewer, R. E., Reynolds, D. A., Steiner, W. A. and Van Gilder, R. D. CARBONIZING PROPERTIES OF COKING COALS. *Ind. Eng. Chem.* **40**, 1243-1254 (1948) *July.*

The continued oxidation of coal (at room temperature and 99°C) as measured by agglutinating tests, chemical analyses and 800° carbonization tests, produced general effects such as (1) a decrease in agglutinating value, carbon and hydrogen contents and heating value, and (2) an increase in true specific gravity and oxygen content. The effects on carbonizing properties were (1) a decrease in strength and fusion of coke and yield of tar, (2) an increase in apparent specific gravity of coke and yield of ammonium sulfate, and (3) irregular proportions of acids and residual pitch in the tar. Correlation of changes in coal and coke properties were established, and a comparative "coking power" durability index is defined and computed at room temperature for each coal tested. The coking power durability of a coal at room temperature is indicative of its commercial storage behavior.

C. Von Fredersdorff

Gas Plant Handling

Fox, W. M. MECHANICAL HANDLING AT GAS-WORKS AND COKE OVENS. *Gas J.* (British) **255**, 202-204 (1948) *July* 28.

A general review of the more modern methods of handling materials at a large English gas plant is presented. Items such as tippers, belt conveyors, bucket elevators, ship hoists, screw conveyors, screens and drag scrapers are mentioned. In the discussion following the paper, the question of the amount of money which could be spent on machinery to replace the labor of one man was treated.

W. J. Merwin

Gas Purification

THE STAATSMIJNEN OTTO PROCESS OF LIQUID PURIFICATION. *Gas J.* (British) **255**, 114 (1948) *July* 14.

This article forms a short survey of the principles involved in the S.M.O. process for H_2S and HCN removal from gas, particularly coal and coke oven gas. The gas is washed with an aqueous solution containing a small amount of ammonia and a suspended iron cyanide complex. H_2S is quantitatively removed from the gas and is largely recovered as elementary sulfur upon regeneration of the wash solution by treatment with air in the amount of 3-5% of the volume of gas treated. If desired, the process may be controlled to produce ammonium thiosulfate and sulfocyanate instead of elementary sulfur. It is claimed that operating costs are low and that the process is not subject to interferences from other impurities in the gas. Operation costs for the purification of coke oven gas by application of the S.M.O. process in a Belgian plant are given to illustrate the economical feasibility of the process in a typical situation.

H. Hakewill

Peak Shaving

Titus, E. INTEGRATING CRACKERS INTO GAS SUPPLY SYSTEMS. *Gas* 24, 47-50 (1948) *May.*

The flow diagram and general method of operation of the catalytic cracking unit recently installed by the Long Island Lighting Company are described. This unit produces a gas for use in meeting peak load demands which is interchangeable in specific gravity and heating value with carburetted water gas by catalytically cracking propane, and/or butane, mixed with air and steam. Considerations in locating the plant in relation to existing plants and pipe lines are briefly discussed. Advantages claimed are low capital investment; flexibility of operation, i.e., gas of a wide range of specific gravity and heating value may be obtained; propane and/or butane may be used, and possibly gasoline; no gas purification is required. Operating costs are comparatively high.

O. Bloomer

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Activated Carbon Manufacture

Godel, A. FLUIDIZATION USED IN MAKING ACTIVATED CARBON. Chem. *Eng.* 55, 110, 112 (1948) *July.*

A French plant is producing activated carbon from sawdust using the fluid principle. The feed is introduced continuously into the upper bed and after a period of treatment is withdrawn to a lower fluidized bed. From the lower bed the material goes to storage. The gases for fluidization are initially provided by combustion of fuel oil, but the process will eventually make its own gases by means of the water gas reaction. The process is said to give greater yields with better control of product quality and also permits the use of finely granulated materials which do not require preliminary carbonization.

W. J. Merwin

Bonding Pipe Fittings

Riddle, H. S. and Harris, H. S. A METHOD OF ELECTRICALLY BONDING HIGH RESISTANCE PIPE COUPLINGS WITHOUT EXCAVATION. *Gas Age* 102, 17-18, 56-57 (1948) *July* 8.

A method is described for electrically bonding high resistance pipe fittings without the excavation of the pipe line. The procedure consists of augering down to the pipe, scarifying the pipe surface, flash brazing the copper wires to both sides of the coupling, and then connecting the copper wires in a shallow trench.

B. E. Hunt

Cleaning Gas Lines

Stephens, D. K. INTERIOR CLEANING FOR MAXIMUM FLOW EFFICIENCY IN NATURAL GAS LINES. *Gas Age* 101, 27-30, 56 (1948) *May* 27; *Gas* 24, 54-58 (1948) *July.*

The economics and operating results of pipe line cleaning during construction and subsequently as flow tests indicate the need are discussed. 566 miles of main line 24 in. and 26 in. diameter pipe were cleaned in 1946 at a cost of $170 per mile exclusive of the cost of the gas lost. Each 8 mile section of the pipe was out on the average of 4 hrs 40 minutes. The total amount of gas lost from drain, go-devil operation, and purge was 5000 Mcf per section. The efficiency of some lines have been raised from 75% to over the theoretical efficiency of

92½%. The cost of cleaning a new line with a go-devil is stated to be little more than blowing to clean it. When there are no metering stations pitot tubes are used to determine the flow. The design of a new type go-devil using wire brushes is discussed.

O. Bloomer

Compressors

Kallam, F. L. ENGINE JACKET WATER COOLING SYSTEMS. *Petroleum Refiner* 27, 115-122 (1948) *July.*

A survey was made of a large number of natural gasoline companies with regard to the engine jacket water cooling systems on their compressors. The conclusions reached were that most engines are operated with inlet water temperatures which are too low and that there is too high a temperature rise through the jackets. Five factors to be considered when attempting to fix jacket water temperatures in gas engines are discussed. Charts are presented showing the results of the survey.

W. J. Merwin

Cycling Plant

Manley, H. W. BENTON UNIT CYCLING PLANT. *Oil Gas J.* 47, 82-86, 90, 92, 94-95 (1948) *August* 19.

A flow sheet and design and operating data are given for the Benton unit cycling plant. Capacity is 50 MMcf/day with recovery of 35% of propane and 80% of butanes.

J. D. Parent

McCaslin, L. S., Jr. NEW CYCLING PLANT PERMITS ECONOMICAL DEVELOPMENT OF SMALL FIELDS. *Oil Gas J.* 47, 198, 200-202 (1948) *June* 24.

A number of mechanical separation plants have recently been installed in small condensate fields where absorption plants would be too costly. Such a cycling plant has recently been installed in the Pinehurst field of Texas at a cost of $550,000. Production is from five sands in the Wilcox formation. Present output is 400 bbl/day of 54° API liquid and will ultimately be about 1000 bbl/day when facilities for greater capacity are available. The liquid yield is about 50 bbl per MMcf. A flow sheet is given.

J. D. Parent

Determination of pH

Shock, D. A. pH DETERMINATION IN CONDENSATE WELL WATER. *World Oil* 128, 141-142 (1948) *July.*

Assuming that most of corrosive action is due to the partial pressure of CO_2 in a gas condensate well, a means of measuring the pH of the gas condensate wellhead-water using a modified standard dew point apparatus is described in this article. The wellhead-water is introduced into a lucite windowed pressure chamber containing a colorimetric pH indicator and the color formed is compared with a known standard buffer solution.

S. Mori

Geology of Gulf Coast

Carsey, J. B. BASIC GEOLOGY OF THE GULF COASTAL AREA AND CONTINENTAL SHELF. *Oil Gas J.* 47, 246-247, 250-251, 266-267 (1948) *June* 24.

A rather general discussion of the basic geological features of the gulf coastal area and the continental shelf is presented. Possible productivity is a feature of the article.

J. D. Parent

Governor Loading

Jones, C. C. AUTOMATIC OVERLOADING OF DISTRICT REGULATOR STATIONS. *Gas* 24, 35-36 (1948) *August.*

The performances of several types of governor loaders are related.

J. D. Parent

Young, D. S. THE AUTOMATIC REMOTE CONTROL OF LOW PRESSURE SYSTEMS. *Gas* 24, 43-45 (1948) *August.*

An automatic remote control system of governor loading is described.

J. D. Parent

Helium Production

Mullins, P. V. HELIUM PRODUCTION PROGRESS. *Chem. Eng. Progress* 44, 567-572 (1948) *July.*

The Bureau of Mines cycle for the separation of helium from natural gas is shown diagrammatically and described. The process involves low temperature and high pressure liquefaction of all the constituents of the gas except helium. The processes involve two steps. The gas is compressed to 600 psi and cooled to approximately —230°F by cold outgoing processed gas. 98% of the gas is liquefied in this step. The remaining crude helium gas phase is then compressed to 2700 lbs and cooled by liquid nitrogen supplied from an auxiliary cycle to approximately —300°F. The remaining nitrogen separates out and 95% helium leaves in the gas phase. Equilibrium and thermodynamic data are presented for a typical helium bearing natural gas. Compression helium separation, and gas treating equipment are described briefly.

O. Bloomer

Liquefaction of Gases

Garner, J. B. THE LIQUEFIED GAS INDUSTRY. *Petroleum Refiner* 27, 120-128 (1948) *August.*

This is an exhaustive review of the subject of liquefaction of gases of all types from the scientific, engineering, and patent view points. For example, it is mentioned that a patent was issued in 1914 for liquefaction of natural gas.

J. D. Parent

LP-Gas

Mattocks, E. O. USING LP-GAS SAFELY IN INDUSTRY. *LP-Gas* 8, 29-31, 78-84 (1948) *July.*

The physical properties and the safe method of storage of LP-gas are discussed. Details such as uses, withdrawal rate, fire protection and fire fighting methods are included.

E. F. Davis

Natural Gasoline-LPG Plant

Love, F. H. PLANT FOR LPG AND NATURAL GASOLINE. *Petroleum Engr.* 19, 41-44 (1948) *July.*

Hiwan Oil and Gas Company is now operating an absorption type gasoline plant in the Atlanta field of Arkansas. A very sour casinghead gas of 2.04% H_2S is being processed. Plant capacity is 10 MMcf per day taken from 54 wells and the yield of liquid products is 10,000 gal of a 60-40 blend of propane and butane plus 12,000 gal of 18 RVP gasoline. Process details are given including inlet and outlet gas analyses.

J. D. Parent

Peak Shaving

Bauer, R. WEATHER-GAS SENDOUT RELATIONSHIP. *Gas* 24, 57-59 (1948) *May.*

The problems of Southern California Gas Company's dispatchers in controlling supply to meet fluctuating demands are discussed. Extensive use is made of weather forecasts to predict firm gas demand and determine the supply to interruptible customers.

O. Bloomer

Eck, J. E. PEAK GAS ECONOMICS. *Gas* 24, 55-56 (1948) *May; Gas Age* 102, 25, 58 (1948) *August* 19.

A method is presented for determining how much peak shaving gas should be used in conjunction with pipe line demand to provide the most economical space heating supply for the greatest number of customers.

O. Bloomer

Petrochemicals

Hightower, J. V. CHEMCEL PETROCHEMICALS. *Chem. Eng.* 55, 105-107, 136-139 (1948) *July.*

The Bishop, Texas, plant of the Chemical Division of Celanese Corporation (Chemcel) is described. About 200,000 gallons per day of propane and butane are converted into acetic acid, formaldehyde, methanol and other chemicals.

C. H. Riesz

Pipe Lines

Martin, J. A. and Tolbert, L. DIRECTING PIPE LINE INSPECTION AND MAINTENANCE. PART I. *Gas Age* 101, 23-26, 56 (1948) *May* 27.

The organization, function, and control over a pipe line inspection and maintenance department are discussed. Records have been set up so that the efficiency and progress of this department are currently available to management. The program is primarily designed for control of pipe line leakage.

O. Bloomer

Mong, P. E. FRICTION FACTOR CHARTS. *Gas* 24, 26-30 (1948) *August.*

Charts are presented which are useful for certain natural gas flow problems.

J. D. Parent

Revell, G. L. and Herbruck, C. G. AUTOMATIC WELDING SPEEDS PIPE LINE WORK. *Petroleum Engr.* 19, 78, 80 (1948) *June.*

Features of a special fixture designed to weld 30 ft lengths of pipe of diameters up to 31 in. into 90 or 150 ft sections are described. Hidden arc automatic deep flux welding technique is used. The welded sections of pipe are trucked to the line where they are tied in with conventional techniques. Up to 4000 ft of pipe can be welded in an 8 hr day, thus contributing to the speed of the job and reducing manpower requirements.

O. Bloomer

PIPE LINES. *Oil Gas J.* 47, 330-332 (1948) *June* 24.

The transcontinental line should develop rapidly. It will consist of 1,760 miles of 26 inch pipe and 71 miles of 20 inch pipe, including 76 river crossings. 15 compressor stations of 8,000 to 12,000 HP will be required and 46,068 Mcf per day of fuel gas will be consumed in generating a total of 160,000 HP. Total cost is to be $151,380,426. Compression is to be from 511 to 815 psi.

J. D. Parent

Purification

Blohm, C. L., Riesenfeld, F. C. and Frazier, H. D. REMOVAL OF ACIDIC CONSTITUENTS FROM GASES. U.S. 2,445, 468 (1947) May 19.

An improved method for the removal of H_2S, SO_2 and CO_2 from natural and refinery gases by means of contact with an absorbent containing reactive amine is described. The addition of alcohol to the amine-containing absorbent is proposed to effect a decrease in the viscosity of the solution so as to provide more efficient contact with the gas being treated and higher heat transfer rates during absorbent regeneration. Twelve claims for the use of absorbents consisting of an amine, water, and a monohydric aliphatic alcohol are made; and the use of monoethanolamine, diethanolamine, benzyl alcohol and tetrahydrofurfuryl alcohol are specified.

H. Hakewill

Reserves

Gruy, H. J. and Crichton, J. A. A CRITICAL REVIEW OF METHODS USED IN ESTIMATION OF NATURAL GAS RESERVES. *Petroleum Technol.* 11, TP-2402 (1948) *July.*

A critical review of methods used in estimation of natural gas reserves is presented.

J. D. Parent

Rock-Drilling

NEW ROCK-DRILL APPLICATION SPEEDS PIPE-LINE CONSTRUCTION OF KENTUCKY CONTRACT. *Oil Gas J.* 47, 76, 103-104 (1948) *July* 15.

For difficult rock drilling the following method was employed. A "boom cat" was used to lift and carry a double drill assembly, and a compressed air machine was towed behind the tractor. The system is said to be very economical and flexible.

J. D. Parent

Transmission

Bristow, A. L. PRESSURE CONTROL AND OTHER PROBLEMS OF LONG LINE GAS DISPATCHING. Paper presented at the American Gas Association Natural Gas Department-Transmission Committee, Houston, Texas, May 4-5, 1948; *Gas Age* 101, 22, 60, 62, 64, 66, 68 (1948) *May* 27.

Functions of a gas dispatching department are discussed. The principal problem of dispatching in the Northern Gas Company is that of pressure control on days with a large degree day deficiency. Curtailment of interruptible customers is the chief means of effecting control. Weather data are used extensively to calculate the daily requirements and consequently to estimate the amount of system capacity curtailment. A new form of contract demand rate which consists of a demand charge and a commodity charge has replaced the firm gas and interruptible gas charge. Gas is curtailed to the utilities in six priority steps issued by zones. The results indicate that the contract demand rate is one of the better schedules for good pressure control. Firm gas requirements are protected and equitable distribution to utilities is assured.

O. Bloomer

Miller, B. GAS TRANSPORTATION SYSTEM CALCULATIONS — Part III — NO. XXVIII. *Gas Age* 102, 26-31 (1948) *July* 8.

Methods of calculating volumetric efficiency, capacity and work of an ideal compressor acting adiabatically are presented.

J. D. Parent

Miller, B. GAS TRANSPORTATION SYSTEM CALCULATIONS. Part III—No. XXX. *Gas Age* 102, 32-36 (1948) *August* 5.

Adjustment of ideal horsepower calculations for actual conditions is explained.

J. D. Parent

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Crude Oil Analyses

Hughes, E. and Blade, O. C. BIBLIOGRAPHY OF REPORTS CONTAINING ANALYSES OF CRUDE OILS BY THE BUREAU OF MINES ROUTINE METHOD. *U.S. Bureau of Mines Information Circular* 7470 (1948) *June.*

This bibliography is a compilation of references to 115 publications which contain analyses of crude oils by the Bureau of Mines. A short abstract is given for each publication, with special reference to the analyses for which it is cited. A finding list is presented, arranged by states and fields, and including 2,457 crude oil samples whose analyses have been published.

L. Ciboch

McKinney, C. M. and Blade, O. C. ANALYSES OF CRUDE OILS FROM 283 IMPORTANT OIL FIELDS IN THE U.S. *U.S. Bureau Mines Report of Investigations* 4289 (1948) *May.*

Detailed crude-oil analyses for samples from 283 of the 350 fields in the United States producing more than 2500 bbls per day are presented. The standard Bureau of Mines method was employed in this work.

H. R. Linden

Desulfurization

Tuttle, R. B. N.C.R.A. CATALYTIC DESULFURIZATION REFORMING UNIT OPERATES ON VARIETY OF CHARGING STOCKS. *Oil Gas J.* 47, 86, 88 (1948) *July* 15.

Desulfurization and octane number improvement were observed on five different feeds by use of a Perco catalytic desulfurization-catalytic reforming unit in refinery tests. Sulfur content of the products ranged from 0.007 to 0.039% by weight while clear octane number improvements varied from 4 to 17 units.

C. H. Riesz

Fischer-Tropsch Synthesis

Anderson, R. B., Hall, W. K. and Hofer, L. J. E. STUDIES OF THE FISCHER-TROPSCH SYNTHESIS. IV. PROPERTIES OF REDUCED COBALT CATALYSTS. *J. Am. Chem. Soc.* 70, 2465-2472 (1948) *July.*

Surface areas, mercury and helium densities and X-ray diffraction properties of cobalt hydrocarbon synthesis catalysts were determined. The presence of thoria and magnesia prevented excessive decreases in surface area on reduction. Kieselguhr was also effective in this respect but, more important, it prevents decrease in bulk volume of the catalyst on reduction. Carbon monoxide adsorption shows that at least 30% of the catalyst must be covered by substances other than cobalt. The X-ray studies indicate that cobalt in the synthesis catalyst has an anomalous structure.

C. H. Riesz

Kummer, J. T., Browning, L. C. and Emmett, P. H. THERMODYNAMIC CALCULATIONS CONCERNING THE POSSIBLE PARTICIPATION OF THE CARBIDES OF IRON AS INTERMEDIATE IN FISCHER-TROPSCH SYNTHESIS. *J. Chem. Phys.* 16, 739-740 (1948) *July.*

From a consideration of equilibrium data for the reduction of iron carbide (Fe_2C) by hydrogen at pressures up to 10 atmospheres, it is concluded that only negligible amounts of mono-olefins can form in the temperature range, 441 to 621°F. Further, production of normal paraffin hydrocarbons with more than six carbon atoms by hydrogenation of Fe_2C is thermodynamically impossible at 621°F and 10 atmospheres pressure of hydrogen. Since large yields

of olefins containing as many as eight carbon atoms are obtained in medium pressure Fischer-Tropsch synthesis over iron catalysts, reduction of bulk Fe_2C is not a tenable mechanism.

C. H. Riesz

Hypersorber

Bland, W. F. DESIGN DETAILS, OPERATING RESULTS OF FIRST COMMERCIAL HYPERSORBER. *Petroleum Processing* 3, 635-638 (1948) *July.*

Recoveries of more than 98% of 93% ethylene from a gas containing less than 6% ethylene are being achieved by the Dow Chemical Company on their new Hypersorber. The process principle involved is the selective adsorption of ethylene on a moving bed of carbon at 140°F with subsequent desorption at 510°F. The carbon moves down the vessel by gravity and is blown back to the top by a gas stream, thus making the process continuous. About 14,000 lbs of 12-30 mesh carbon is used in the unit and the carbon losses are 90-100 lbs/day. The capacity of the unit is 1,800,000 SCF/day of feed gas. The tower is 4½ ft in diameter and about 85 ft high. A flow sheet and various pictures of the installation are presented. A table is given showing utility requirements and a discussion of operating problems is presented.

W. J. Merwin

Synthetic Fuels

Perry, G. T. FUELS AND LUBRICANTS FROM SOURCES OTHER THAN PETROLEUM. *Can. Chem. Process Ind.* 32, 624-629 (1948) *July.*

Present known methods of synthesizing liquid fuels and lubricants are reviewed. Although at present Canada imports 85% of its crude oil requirements, it is concluded that Canada could be made independent of outside crude oil sources by hydrocarbon synthesis starting from coal.

C. H. Riesz

7. ANALYTICAL METHODS AND TESTS

Aldehyde Determination

Reynolds, J. G. and Irwin, M. THE DETERMINATION OF FORMALDEHYDE AND OTHER ALDEHYDES. *Chem. & Ind.* (British) 27, 419-424 (1948) *July* 3.

The authors conducted considerable research on the detection and estimation of aldehydes in connection with an investigation of the mechanism of combustion in spark ignition, compression ignition, and gas turbine engines by analysis of their condensed exhaust gases. Gravimetric, volumetric, colorimetric, potentiometric and spectrographic procedures for aldehyde determination are briefly discussed in survey fashion. The various analytical methods and their general applications are listed and literature references are given in a convenient summary at the end of this article.

H. Hakewill

Carbon Monoxide Determination

Beckman, A. O., McCullough, J. D. and Crane, R. A. MICRODETERMINATION OF CARBON MONOXIDE IN AIR. *Anal. Chem.* 20, 674-677 (1948) *July.*

An instrument is described which makes a microdetermination of carbon monoxide in air (a few parts per million up to about 3%). It is based on two chemical reactions: one between carbon monoxide and red mercuric oxide to give carbon dioxide and mercury vapor; and the other, between mercury vapor and selenium sulfide. The latter is made on selenium sulfide test paper which is darkened when mercury-containing air flows over it. The length of black coloration is a direct measure of the carbon monoxide. Instrument accuracy is high enough

for many laboratory and most field requirements and it has the advantages of speed and simplicity.

M. C. Miyaji

Heat of Combustion

Letourneau, R. L. and Matteson, R. MEASUREMENT OF HEAT OF COMBUSTION OF VOLATILE HYDROCARBONS. *Anal. Chem.* 20, 663-664 (1948) *July.*

Considerable difficulty has been experienced in present methods of determination of the heat of combustion of low boiling point liquid fuels in the Parr calorimeter. A comparatively leakproof sample holder has been devised which has successfully held isopentane at 25°C, only 3°C below its boiling point. The sample holder consists of a 52% nickel alloy steel cylinder ½ in. in diameter and 1 in. long sealed at one end. A tight fitting cap, open in the center, is fitted over a piece of scotch tape on the top of the cylinder. The holder fits in the standard Parr bomb. Blanks are determined on the scotch tape and subtracted from the total heat of combustion. All instructions of ASTM procedure D240-39 which applied to this setup were followed. The deviation in several determinations of different samples were in every case below 0.30%.

R. D. Clevenger

Moisture in Coal

Cooper, H. M., Tarpley, E. C. and Abernethy, R. F. DETERMINATION OF MOISTURE IN COAL WITH THE BRABENDER SEMI-AUTOMATIC TESTER. *U.S. Bureau of Mines Report of Investigations* 4304 (1948) *June.*

Tests were made by the U.S. Bureau of Mines, in cooperation with A.S.T.M. Committee D-5 on coal and coke, to ascertain the feasibility of using the Brabender semi-automatic tester to determine the moisture in coal. The Brabender moisture tester is a combination of drying oven and balance with a capacity of ten 10-gram samples. Weighings are made without removing samples from the oven and without disturbing the drying process. From the results of comparative tests using the standard A.S.T.M. procedure for moisture determination and the Brabender moisture tester it was concluded that, except for anthracite, it is possible to obtain moisture values within the permissible A.S.T.M. tolerances with the Brabender instrument.

H. Hakewill

Naphthalene Determination

Thornton, D. P., Jr. POLAROGRAPHIC DETERMINATION OF NAPHTHALENES IN KEROSINE AND LIGHT GAS OILS. *Petroleum Processing* 3, 673-675 (1948) *July.*

A polarographic dropping mercury cathode method for the detection of as little as 10^{-6} grams of naphthalene in a 0.5cc sample of kerosene or light gas oil is described. The method is based on the reduction of naphthalenes in a dioxane-water medium containing tetra-n-butyl ammonium iodide as a supporting electrolyte. Commercial equipment is available which automatically plots the current-voltage curve as the analysis proceeds. The polarogram is recorded between —1.80 to —2.30 volts and a sample of less than 0.5 ml dissolved in 10 ml of electrolyte is used.

H. R. Linden

Oxygen Determination

Walton, W. W., McCulloch, F. W. and Smith, W. H. DETERMINATION OF SMALL AMOUNTS OF OXYGEN IN ORGANIC COMPOUNDS. *J. Research Natl. Bur. Standards* 40, 443-447 (1948) *June.*

A direct method for the accurate determination of traces of oxygen-containing compounds is described. The essentials of the procedure are the pyrolysis of the sample in an atmosphere of helium, conversion of the oxygen compounds that are formed to carbon monoxide by passage

of the products over pellets of carbon at a temperature of 1120°C and collection of the carbon monoxide in a flask of known volume. Interfering substances are removed by passage of the gas through a liquid-air or potassium hydroxide trap before collection of the gas. The percentage of carbon monoxide in the collected gas is analyzed with the use of NBS colorimetric indicating gel. As little as 0.01% of oxygen can be determined.

M. C. Miyaji

8. GENERAL AND PHYSICAL CHEMISTRY

Activity Coefficients

Berg, C. and McKinnis, A. C. EFFECT OF TEMPERATURE ON LIQUID PHASE ACTIVITY COEFFICIENTS. *Ind. Eng. Chem.* 40, 1309-1311 (1948) *July.*

For many purposes in close boiling systems it may be satisfactorily assumed that activity coefficients are independent of temperature. However, in many systems the effect of temperature on activity coefficients must be considered. By making simplifying assumptions the Hildebrand equation for variation of activity coefficient with composition and temperature has been reduced for a system of constant composition to give an expression of the form

$$\log Y = K[(1 - T_r)/T_r]^{.43};$$

X = constant where Y = activity coefficient, T_r = pseudo reduced temperature of the mixture. This equation has been checked on several systems and seems suitable for estimating vapor pressure behavior of components of regular solutions and may have limited applications in consideration of solutions containing associated liquids.

O. Bloomer

Free Energies

Bremmer, J. G. M. and Thomas, G. D. THE STANDARD FREE ENERGIES OF FORMATION OF GASEOUS ORGANIC COMPOUNDS: A GROUP METHOD OF SUMMATION. *Trans. Faraday Soc.* (British) 44, 230-238 (1948) *April.*

The standard free energies of aliphatic compounds are shown to be additive properties of characteristic groups over a wide temperature range. A modified procedure may be used for cyclic compounds.

S. Katz

Kinetics

Chien, J. Y. KINETIC ANALYSIS OF IRREVERSIBLE CONSECUTIVE REACTIONS. *J. Am. Chem. Soc.* 70, 2256-2261 (1948) *June.*

Differential equations are set up and solved for the following classes of irreversible consecutive reactions; uni-unimolecular, uni-bimolecular, bi-unimolecular, and bi-bimolecular. The application to experimental data is discussed briefly.

S. Katz

Laidler, K. J. and Glasstone, S. RATE, ORDER AND MOLECULARITY IN CHEMICAL KINETICS. *J. Chem. Ed.* 25, 383-387 (1948) *July.*

Recent criticism of the present status of chemical kinetics has prompted this elementary review of the subject. The logic and consistency of the science is established. Special attention is given to the distinction between reaction order and molecularity, and complex reactions are briefly considered.

A. J. Rudnitzki

Van Krevelen, D. W. and Hoftijzer, P. J. KINETICS OF SIMULTANEOUS ABSORPTION AND CHEMICAL REACTION. *Chem. Eng. Progress* 44, 529-536 (1948) *July.*

Rate equations are proposed for the case of absorption of a gas followed by slow reaction

in the liquid phase. The order of reaction is taken into consideration.

J. D. Parent

Wood, A. M., Crank, J. and Twigg, G. H. THE APPLICATION OF THE DIFFERENTIAL ANALYZER TO A PROBLEM IN CHEMICAL KINETICS. *Trans. Faraday Soc.* (British) 44, 256-262 (1948) *April.*

Analysis of many of the systems encountered in chemical kinetics lead to mathematical solutions which may not be expressed in terms of known functions. The use of a differential analyzer in conjunction with one or two sets of experimental data to set up a completely general procedure for predicting the course of the reaction under a wide variety of experimental conditions is described. The catalytic oxidation of ethylene is used to illustrate the procedure.

S. Katz

Methane Synthesis Kinetics

Akers, W. W. and White, R. R. KINETICS OF METHANE SYNTHESIS. *Chem. Eng. Progress* 44, 553-566 (1948) *July.*

An experimental investigation of the reaction of carbon monoxide and hydrogen over reduced nickel catalyst at 1 atm and 300-350°C is reported. Methane, in concentrations as high as 40 mol per cent is obtained. The data are correlated by a method based on recent theories of the kinetics of heterogeneous reactions. It is shown that the surface reaction rate is the controlling process for methane synthesis and an expression for the rate of methanization is derived. An empirical equation for the initial rate of carbon dioxide formation, by a secondary reaction, is also obtained.

A. J. Rudnitzki

Pore Size Distribution

Ritter, H. L. and Erich, L. C. PORE SIZE DISTRIBUTION IN POROUS MATERIALS. *Anal. Chem.* 20, 665-670 (1948) *July.*

An application of the theory of small-angle X-ray scattering as developed by Guimier is made to pore size distribution in some silica-alumina gels and fuller's earth. A diagram of the small-angle X-ray camera used is given and the geometry of the system is diagramed. Methods are given for the inversion of the Guimier integral under certain simplifying assumptions and for making the correction for a finite collimating system. A correlation of the results is made with data from the mercury porosimeter and adsorption measurements. The use of X-ray scattering for size determination is still uncertain and additional correlative data are necessary.

E. J. Pyrcioch

SO_2 Oxidation

Whittingham, G. THE OXIDATION OF SULPHUR DIOXIDE IN SLOW COMBUSTION PROCESSES. *Trans. Faraday Soc.* (British) 44, 141-142 (1948) *March.*

The oxidation of SO_2 in a coal gas flame is shown to be a reaction between the SO_2 and atomic oxygen. Similar studies with CO, CH_4, CH_3OH, hexane, and ether lead to similar conclusions. The mechanisms of the reactions are discussed and probable intermediates are considered.

S. Katz

Surface Area Measurement

Carman, P. C. and Arnell, J. C. SURFACE AREA MEASUREMENTS OF FINE POWDERS USING MODIFIED PERMEABILITY EQUATIONS. *Can. J. Research (Sec. A)* 26, 128-136 (1948) *May.*

A resumé is given of equations of the Kozeny type recently proposed for flow of gases through porous beds.

J. D. Parent

Thermal Properties of Petroleum Oils

Van Winkle, M. THERMAL PROPERTIES OF PETROLEUM OILS. PART I—MEAN SPECIFIC HEATS OF PETROLEUM LIQUIDS AND VAPORS. *Petroleum Refiner* 27, 81-85 (1948) *June.*

In this paper the latest revision of the mean specific heat and enthalpy data for petroleum oils and vapors is presented in form similar to that used by Watson et al (Ind. Eng. Chem. 25, 880, 1933; 29, 1408, 1937). Charts for reference temperatures of 0°F and 32°F are given showing the variation of mean specific heat and enthalpy with temperature for the normal ranges of API gravity and UOP characterization factor.

H. R. Linden

Van Winkle, M. THERMAL PROPERTIES OF PETROLEUM OILS. PART II—ENTHALPIES OF SATURATED AND SUPER HEATED PETROLEUM VAPORS AT ATMOSPHERIC PRESSURE. *Petroleum Refiner* 27, 123-128 (1948) *July.*

This second in a series of three articles on the thermal properties of petroleum oils presents enthalpy-temperature charts for saturated and superheated petroleum vapors at atmospheric pressure. The variables correlated in these charts are: 100% flash vaporization temperature (dew point), slope of flash curve, API gravity, and UOP characterization factor. The data were obtained from existing correlations of various physical and chemical properties of petroleum oils.

H. R. Linden

Thermodynamic Properties

Sage, B. H., Olds, R. H. and Lacey, W. N. TWO GASEOUS MIXTURES CONTAINING HYDROGEN AND NITROGEN. *Ind. Eng. Chem.* 40, 1453-1459 (1948) *August.*

Thermodynamic properties for a hydrogen-nitrogen mixture and a five component mixture containing these substances are given.

J. D. Parent

Viscosity of Vapors

VISCOSITY OF VAPORS—GAS OIL, KEROSINE AND NAPHTHA. *Oil Gas J.* 46, 109 (1948) *February* 12.

The viscosity of gas oil, kerosine, and naphtha vapors were calculated by the reduced state correlation of Uyehara and Watson at pressures up to 700 psi. Graphs are presented for gas oil and naphtha.

O. Bloomer

Water Solubility Data

Black, C., Joris, G. G. and Taylor, H. S. THE SOLUBILITY OF WATER IN HYDROCARBONS. *J. Chem. Phys.* 16, 537-543 (1948) *May.*

The solubility of water in several saturated and unsaturated hydrocarbons in the range of 5 to 30°C and 1 to 6 atm is reported.

J. D. Parent

9. ORGANIC CHEMISTRY

Cyclodehydrogenation

Orchin, M., Reggel, L., Friedel, R. A. and Woolfolk, E. O. AROMATIC CYCLODEHYDROGENATION. *U.S. Bureau of Mines Technical Paper* 708, 1948.

Cyclodehydrogenation of aromatic or hydroaromatic compounds by intramolecular loss of hydrogen to form a new compound with a greater number of rings has been studied at the Bureau of Mines over a period of several years and is summarized in the present paper. Conversion of 2-methyldiphenyl to fluorene by passage over palladium catalyst is typical of the reactions investigated. The results show that the presence of a particular polynuclear aromatic compound in coal tar or in coal-hydrogenation liquid cannot be considered as conclusive evidence that such a unit existed in the original coal structure.

C. H. Riesz

Isomerization

Beeck, O., Otvos, J. W., Stevenson, D. P. and Wagner, C. D. THE ISOMERIZATION OF PROPANE WITH C^{13} IN ONE END POSITION. *J. Chem. Phys.* **16**, 255-256 (1948) *March.*

Catalytic isomerization of propane with a heavy carbon atom in one end position (C^{13} as tracer) was investigated over aluminum bromide at room temperature. The rate of isomerization of propane-1-C^{13} to propane-2-C^{13} with C^{13} in the middle position is comparable to the rate of isomerization of normal butane to isobutane. The equilibrium ratio of propane-1-C^{13} to propane-2-C^{13} was 2, the statistical equilibrium distribution. Since no molecules containing two C^{13} carbon atoms were formed, the purely intramolecular character of the isomerization reaction is unambiguously established.

C. H. Riesz

Otvos, J. N., Stevenson, D. P., Wagner, C. D. and Beeck, O. ISOMERIZATION OF n-BUTANE-1-C^{13}. *J. Chem. Phys.* **16**, 745 (1948) *July.*

The isomerization of n-butane-1-C^{13} in the presence of water promoted aluminum bromide catalyst at about 77°F has been studied. It appears that general activation of the molecule as a whole rather than attack at a particular point is the first step in the isomerization reaction. As was reported previously for propane isomerization, butane isomerization is exclusively intramolecular with respect to the carbon atoms.

C. H. Riesz

10. CHEMICAL ENGINEERING

Distillation

Edmister, W. C. EFFECTIVE ABSORPTION AND STRIPPING FACTORS FOR MULTICOMPONENT FRACTIONATION CALCULATION. *Chem. Eng. Progress* **44**, 615-618 (1948) *August.*

Edmister has previously suggested a method of solving multicomponent distillation problems based on absorption and stripping factors. These factors enter as functions which can be obtained by a knowledge of individual plate conditions or approximately by end conditions. The present paper provides a basis for making the short cut calculations based on terminal conditions quite accurately.

J. D. Parent

Edmister, W. C. HYDROCARBON ABSORPTION AND FRACTIONATION PROCESS DESIGN METHODS. PART 14. MINIMUM PLATES AND REFLUX LIMITS OF DESIGN. *Petroleum Engr.* **19**, 66, 72, 76, 78, 80, 82 (1948) *July.*

The major topics covered in this installment are the calculations of minimum number of

plates and minimum reflux ratio. Fenske's method is used in the first case while the methods of Gilliland, Underwood, Colburn, Scheibel-Montross, and Bailey-Coates are given for the second. The Brown-Martin method is to be covered elsewhere.

J. D. Parent

Edmister, W. C. HYDROCARBON ABSORPTION AND FRACTIONATION PROCESS DESIGN METHODS. PART 15. SHORT CUT AND EMPIRICAL EQUILIBRIUM PLATE CALCULATION METHODS. *Petroleum Engr.* 19, 47-53 (1948) *August.*

This is a continuation of the excellent design series and treats short cut multicomponent distillation methods.

J. D. Parent

Scheibel, E. G. and Montross, C. F. OPTIMUM FEED TRAY IN MULTICOMPONENT DISTILLATION CALCULATIONS. *Ind. Eng. Chem.* 40, 1398-1401 (1948) *August.*

The authors offer an equation to determine the optimum feed tray. The ratio of the keys in the feed tray liquid at total reflux is calculated by a simple relation; the ratio of the keys in the feed-tray liquid at minimum reflux has also been correlated to an empirical equation. The resulting equation is expressed as a function of the limiting values. This eliminates the trial and error procedure of carrying out tray-to-tray calculations using different feed tray locations to determine the optimum feed tray.

H. Dirksen

Underwood, A. J. V. FRACTIONAL DISTILLATION OF MULTICOMPONENT MIXTURES. *Chem. Eng. Progress* 44, 603-614 (1948) *August.*

A rigorous analytical solution for multicomponent distillation calculations is presented. Limitations are constant molal reflux and relative volatilities. "Unspecified" components can be adequately considered. The Underwood method of determining minimum reflux ratio is further extended.

J. D. Parent

Equilibrium Flash Calculations

Scheibel, E. G. NOMOGRAPH FOR EQUILIBRIUM FLASH CALCULATIONS. *Petroleum Refiner* 27, 136-137 (1948) *July.*

A nomograph for the trial and error calculation of the equilibrium flash of a multi-component mixture for assumed ratios of moles of liquid to moles of vapor (L/V) from the K values and feed rates of the various components is presented. The results are given in moles of liquid of the component. The accuracy of the nomograph can be adjusted to any magnitude of feed rate of the various components by changing the scale factor.

H. R. Linden

Ethylene Recovery

Kehde, H., Fairfield, R. G., Frank, J. C. and Zahnstecher, L. W. ETHYLENE RECOVERY COMMERCIAL HYPERSORPTION OPERATION. *Chem. Eng. Progress* 44, 575-582 (1948) *August.*

The operation and performance of the first commercial hypersorption unit is described. It is unit built by Foster-Wheeler for Dow to recover small concentrations of ethylene from a hydrogen-methane stream. From a gas feed of 4½ to 6% ethylene a product of 92 to 93% purity is obtained. The overhead stream contains less than 0.1% ethylene. The process, which has been described in detail in earlier articles, consists essentially of selectively adsorbing a substance from a gas stream by a downwardly moving bed of activated charcoal, regenerating the charcoal by steam and cooling and recycling the charcoal. An interesting characteristic of the process is that a minimum adsorbent to gas ratio exists below which the sharpness of separation declines notably.

J. D. Parent

Fluidization

Leva, M., Grummer, M., Weintraub, M. and Pollchik, M. INTRODUCTION TO FLUIDIZATION. *Chem. Eng. Progress* 44, 511-520 (1948) *July.*

This is the first of a series of three papers. A brief description of the mechanism of fluidization is given, followed by a description of the apparatus and procedure used in the present study. Data are presented showing the relationship between pressure drop and modified Reynolds number when gases are passed through uniform round and sharp sands in a 4 in. tube. The data are correlated and an equation is presented which permits calculation of the fluid velocity necessary to bring a bed of sand to incipient fluidization. A sample calculation is given.

W. J. Merwin

Heat Transfer

Kayan, C. F. FIN HEAT TRANSFER BY GEOMETRICAL ELECTRICAL ANALOGY. *Ind. Eng. Chem.* 40, 1044-1049 (1948) *June.*

For a fin integral with its base material, or attached to it through substantially negligible thermal resistance, analysis of steady-state heat transfer and of resultant temperatures throughout the structure is rendered difficult by the distorted temperature conditions within the fin assembly, particularly at the base. By the method of electrical analogy, the performance to be expected under different conditions of surface conductance and material conductivity has been investigated for two fin structures of given proportions. Temperature distributions within the structure and along the surfaces, as well as over-all heat transfer values, may be established through the medium of dimensionless temperature-distribution and relative thermal-resistance charts included in the paper. Calculated fin surface values predicated on fin-base test values are included for comparison with those determined through the analogy method.

Author's abstract

Winding, C. C. and Cheney, A. J., Jr. MASS AND HEAT TRANSFER IN TUBE BANKS. *Ind. Eng. Chem.* 40, 1087-1093 (1948) *June.*

A new experimental technique has been developed to obtain heat transfer coefficients in tube banks. Naphthalene tubes are cast in any desired shape and then inserted into various positions in a dummy tube bank. Mass transfer coefficients are obtained from the loss in weight and change in dimensions. Heat transfer coefficients are calculated by the use of Chilton and Colburn's analogy for the transfer of heat and mass. Results obtained by this method are compared with available data for both single tubes and banks. The results appear to be well within the limits of accuracy of other data and compare favorably with recommended average correlations of such data. Some new information is presented for single streamline tubes and flat plates and for staggered round and streamline tube banks.

Authors' abstract

Mechanical Mixing

Beaudry, J. B. BLENDER EFFICIENCY. *Chem. Eng.* 55, 112-113 (1948) *July.*

A series of equations are presented by means of which the blending efficiency can be calculated for mechanical mixing operations. The equations are derived on the basis of statistical analysis.

W. J. Merwin

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Cyclones

First, M. W. and Silverman, L. FACTORS IN THE DESIGN OF CYCLONE DUST COLLECTORS. *Heating & Ventilating* 45, 80-86 (1948) *July.*

Using Stokes law and expressions for tangential velocity and radial acceleration of particles, equations are derived for the separating efficiencies of cyclones. Pressure drop equations are derived from expressions for velocity distribution in a cyclone and contraction and expansion head losses. A combination of efficiency and pressure drop equations yields general equations involving (1) the minimum tangential velocity required for complete separation of a given size, and (2) minimum particle size completely removed in terms of the dimensions of the cyclone and minor experimental constants. It is noted that available theoretical and empirical equations for performance indicate the important design and operating variable in their proper mutual relationship except for minor constants to be determined experimentally.

C. Von Fredersdorff

Heat Exchangers

Rubin, F. L. SHELL AND TUBE HEAT EXCHANGERS. *Petroleum Refiner* 27, 139-145 (1943) *July.*

A general discussion of shell and tube heat exchangers is given and several drawings are presented showing and labeling heat exchanger parts. The author discusses the following types of exchangers: fixed tube sheet, internal floating head, U-tube, and packed floating head. The API-ASME code and the TEMA Standards are used for design of exchangers. Exchanger design conditions are mentioned; and the installation, operation, and cleaning of exchangers are covered. Curves are given showing the relationship between cost and surface and between weight and shell size.

W. J. Merwin

Instrumentation

James, L. S. INSTRUMENTATION AND AUTOMATIC CONTROL. *Gas World* (British) 129, 121-128, 131 (1948) *July* 24.

This is a summary of Part I of a paper presented to the London and Southern Junior Gas Association May 7, 1948. The various advantages and disadvantages of the three common methods of installing instruments—near measuring points, centralized instrument rooms, and sectional groupings—are discussed. Brief notes are presented on certain specific measurements such as temperature, steam-flow, vacuum or pressure, and CO_2 content of gases. The automatic control of producers and the characteristics of producer control are discussed along with the instrumentation of exhauster houses and purifier plants.

B. E. Hunt

Piping System

Erickson, H. A. PIPING SYSTEM CONSTRUCTION COSTS. *Heating & Ventilating* 45, 78-84 (1948) *August.*

A detailed cost analysis is presented for a piping system constructed with the usual threaded connections and for a system constructed by welding the joints in so far as possible. The arc welded installation showed a saving of 7.4% over the conventional installation. The arc welded system also had 8% lower insulation cost. Besides this the arc welded system requires little or no expense for maintenance. Ten tables are presented by which the labor costs involved in connecting pipe may be estimated.

W. J. Merwin

Temperature Measuring

Cichelli, M. T. DESIGN OF TEMPERATURE MEASURING ELEMENTS. *Ind. Eng. Chem.* 40, 1032-1039 (1948) *June.*

A method is proposed for calculating the distance a temperature-measuring element must extend into a gaseous atmosphere in order to reduce the error of reading resulting from the conduction and the radiation of the unit to a certain value. The solution of this problem and several sample calculations are given illustrating the application of this solution to various typical temperature measuring installations. The cases considered are bare elements, protected uninsulated elements, unprotected insulated elements, and protected insulated elements.

B. E. Hunt

12. MATERIALS OF CONSTRUCTION

Atmospheric Corrosion

Hudson, J. C. THE ATMOSPHERIC CORROSION OF FERROUS METALS AND ITS PREVENTION. *Gas World "Supplement"* (British) 129, 83-100 (1948) *July* 3.

The author mentions the types of corrosion encountered in his plant and describes their practices as regards corrosion prevention. Customary methods of combatting corrosion are to neutralize or remove the corrosive agents or to select an alloy to resist the corrosive action. A discussion of the utility of various alloys in several services is given.

W. J. Merwin

Corrosion in Refineries

Furth, M. A. PREVENTION OF CORROSION IN REFINERY HEAT-EXCHANGER EQUIPMENT. *Petroleum Refiner* 27, 129-134 (1948) *July.*

A. Girard's theory on rusting in the atmosphere is presented. Relative humidity and pollution of air by foreign particles play a large part in rusting, and severe cases are obtained when these two factors are large. Atmospheric corrosion of iron may be combatted by alloying the ferrous metals, or by applying a paint or a metallic coating. In the coating processes, the metal must be very carefully cleaned before applying the protective coats. Methods of cleaning are discussed in detail.

Corrosion Resistant Alloys

Eilerts, C. K., Greene, F., Archer, F. G., Hanna, B. and Burman, L. M. ALLOYING STEELS FOR CORROSION RESISTANCE TO GAS-CONDENSATE FLUIDS—PART 2. *Corrosion* 4, 321-356 (1948) *July.*

Laboratory tests on different alloying steels, using various corrosive chemicals found in gas condensate wells revealed that stainless steel and copper nickel alloys were promising. Sodium arsenite solution was an effective corrosion inhibitor with alloys in contact with a solution of hot hydrochloric acid. Use of plated lining inside a corrosive area as well as an attempt to find an alloy that would prefer the hydrocarbon phase wetting rather than the water phase did not appear too promising.

S. Mori

Underground Corrosion

Denison, I. A. CHEMICAL ASPECTS OF UNDERGROUND CORROSION AND CORROSION PREVENTION. Paper presented at the A.G.A. 1948 Joint Production and Chemical Committee Conference, Asbury Park, N. J., May 24-26, 1948.

Due to differences in the concentration of oxygen on the various parts of the metal surface, a galvanic cell may be set up causing pitting to take place. There are many environmental factors in the soil which influence the rate of pitting and corrosion but the most destructive is poor aeration. Of the different alloys, stainless steel containing more than 18% chromium and 8% nickel was found to be most promising against underground corrosion. In using zinc, aluminum, or magnesium as a sacrificial annode in a cathodic protection system, care must be taken that they are surrounded by optimum conditions. This may be created by the use of backfill containing the lacking substances.

S. Mori

CATHODIC PROTECTION OF UNDERGROUND STRUCTURES. *Gas Age* 102, 25, 57-58 (1948) *July* 8.

Steel rings buried in the soil 3 to 5 years at eight different sites and protected cathodically by means of a zinc steel anode showed that a minimum of a 1:20 ratio of zinc to steel area was required for adequate corrosion protection. In applying an external current for cathodic protection the minimum required current density may be obtained by starting at a low current density and gradually increasing it until the potential on the protected metal begins to rise. When this point is reached, the metal is protected from any galvanic corrosion.

S. Mori

13. NEW BOOKS

Acetylenic Compounds

Johnson, A. W. ACETYLENIC COMPOUNDS. VOLUME I, ACETYLENIC ALCOHOLS. London, Edward Arnold and Company, 1946.

The literature relating to the properties and chemical reactions of acetylenic alcohols is reviewed, all material being complete up until about September, 1945. The book is divided into three parts, namely (1) compounds containing one acetylenic bond and one hydroxyl group, (2) compounds containing one acetylenic bond and more than one hydroxyl group, and (3) hydroxy compounds containing more than one acetylenic bond. The chemistry of the rubenes and applications of the reactions of the acetylenic carbinols in the sex hormone series are presented in separate appendices. Another appendix lists known acetylenic alcohols including the principal physical constants with appropriate literature references. Other volumes are in preparation devoted to acetylenic acids and to acetylenic carbonyl compounds.

C. H. Riesz

Chemical Technology

Kirk, R. E. and Othmer, D. F. ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY. VOL. I. New York, The Interscience Encyclopedia Inc., 1947.

This volume is the first in a series designed to fill the need for an encyclopedia of chemical technology representing modern American prac-

tice and chemical engineering. It is organized as a specialized encyclopedia descriptive of technologically important materials, methods, and phenomena. In general the topics are grouped according to their technological relationship excepting where individual compounds are of sufficient importance to warrant separate articles. Background articles of a theoretical nature are presented where they may serve as a reference for several methods employing the same principle. Wherever necessary, flow sheets, diagrams, and photographs have been used to illustrate the processes. The articles have been written by authorities in the field and then reviewed by other specialists to prevent biased remarks about a material or process and to exclude any inconsequential material.

B. E. Hunt

Fuel Testing

Himus, G. W. FUEL TESTING. London, Leonard Hill Limited, 1946.

Methods of sampling and analysis of solid, liquid, and gaseous fuels are described, and the general principles underlying these methods are discussed. This book consists of 292 pages and is divided into fifteen chapters, each of which is followed by a bibliography giving additional references. Specific topics relating to the examination of coal include: sampling, proximate analysis, ultimate analysis, miscellaneous determinations, calorific value, carbonization assays, mineral matter, coal ash analysis, fusion point of coal ash, and selection of coal for industrial uses. Two chapters are devoted to gas, one on gas analysis and the other on calorific values of gases; and three other chapters describe tests on liquid fuels, technical pyrometry, and combustion calculations, respectively. Numerous illustrations, examples, and special notes on procedure are incorporated to make tests and calculations understandable to student and laboratory technician.

H. Hakewill

Corrosion Handbook

Uhlig, H. H. CORROSION HANDBOOK. New York, John Wiley & Sons, Inc., 1948.

The Corrosion Handbook is composed of chapters by many contributors, each a specialist in his particular field. Included in the nine sections of this book are: theories on corrosion, corrosion resistance of metals, alloys and nonmetals, corrosion protection, and corrosion testing. The section on corrosion theories gives some conflicting views indicating there is much that is still unknown. Of particular interest to the gas industries are units on subsurface pipeline protection; corrosion in the soil; and the many useful charts and tables found in the section on high temperature corrosion of metals and alloys under various conditions.

S. Mori

Natural Gasoline

Brown, G. G., Katz, D. L., Oberfell, G. G. and Alden, R. C. NATURAL GASOLINE AND VOLATILE HYDROCARBONS. (Section I). Tulsa, Oklahoma, Natural Gasoline Association of America, 1948.

Properties of the more volatile petroleum and natural gasoline hydrocarbons are presented in tabular and graphical forms. Numerous correlations are given. Illustrative examples are numerous and easy to follow. A number of topics, including phase studies and compressibility factors, are discussed in a very simple manner. Included in this work are 68 figures and 144 references.

J. D. Parent

Nomography

Levens, A. S. NOMOGRAPHY. New York, John Wiley & Sons Inc., 1948.

A readily understood summary is presented of the techniques employed in constructing nomographs, emphasis being placed on the "geometric method" in developing the theory for equations of three or more variables. The reader is introduced to a manipulation of functional scales and is then led to addition and multiplication charts, Z-charts, proportional charts and other standard forms. Practical short cuts involving geometric construction and the basic ideas in the use of determinants in constructing alignment charts are included. This is a good self-explanatory text for the beginner since each illustrative example is worked out in complete detail. Approximately 40 charts based on practical engineering formulas are distributed throughout the text and the appendix.

C. Von Fredersdorff

Petroleum Production

Jones, P. J. PETROLEUM PRODUCTION. VOLUME III. OIL PRODUCTION BY WATER. New York, Reinhold Publishing Corporation, 1947.

The principal factors in production of oil by water are said to be: convergence, fluid factors, invasion factors, displacement factors and well-interference factors. In the first part of the book the author defines these terms, presents equations for them and discusses their relationship to optimum rate of oil production, most efficient rate of oil production, well spacing, number of wells, etc. In the second part of the book, the author presents applications of the theories developed in the first part to oil reservoirs of various shapes, such as radial, linear, elongated, etc.

W. J. Merwin

Jones, P. J. PETROLEUM PRODUCTION. VOLUME IV. CONDENSATE PRODUCTION AND CYCLING. New York, Reinhold Publishing Corp., 1948.

Fundamental cycling considerations are presented and applications to certain types of idealized reservoirs are presented.

J. D. Parent

Synthine Process

Weil, B. H. and Lane, J. C. SYNTHETIC PETROLEUM FROM THE SYNTHINE PROCESS. Brooklyn, New York, Remsen Press, 1948.

The huge mass of literature pertaining to the production of synthetic liquid fuels by the catalytic hydrogenation of carbon monoxide has been collected and selected information presented. The material is divided for discussion into four main categories: (1) production and purification of synthesis gas, (2) catalytic synthesis, including catalysts, mechanisms and reaction variables, (3) products, by-products and derivatives, and (4) basic economics and current developments. Nearly 400 references are in the main text and a supplementary bibliography of 81 references covers the period 1940-1946. United States and foreign patents are listed by number under various subject classifications. A listing of 157 government-released reports is cross-indexed according to subject matter as well as to the various government report designations (i.e., PB, BIOS, CIOS, TAC, TOM, USNTME and Bureau of Mines I.C.). The book, first to cover the entire subject, is well-organized and impartially presented.

C. H. Riesz

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